Cisco **IP/VC 3540** Series Videoconferencing System

The Cisco IP/VC™ 3540 Series Videoconferencing System integrates multipoint conferencing, multimedia gateway, and data collaboration into a single platform for cost-effective deployment of IP-centric, converged networks. Built upon industry-standard H.323 technology, the Cisco IP/VC 3540 Series allows a wide range of customized, converged voice, video, and data solutions. It has the scalability, performance, and multivendor interoperability required by enterprises and service providers alike.

Converged Voice, Video, and Data Communications

In order to thrive in a global marketplace, today's business, government, educational, and medical organizations of all sizes need to provide their stakeholders with the ability to capitalize on rapid change. This requires communications tools that support collaboration in real time, from anywhere in the world.

The Cisco IP/VC 3540 Series Videoconferencing System effectively eliminates the barriers of time, distance, and resources, permitting people across the globe to function as if they were in the same room. Companies can integrate telecommuters, enjoy fast decision-making, and more effectively train and educate

employees. Educational institutions can interactively disseminate knowledge anywhere, creating a true "campus without walls." Doctors can consult specialists from any part of the world to provide the best care for their patients at a reasonable cost. Organizations can reduce administration costs and increase their profitability and competitiveness as never before.

For service providers and next-generation carriers, the IP communications evolution has created a competitive landscape that places a premium on innovation and value-added service. The Cisco IP/VC 3540 Series lets these businesses quickly deploy IP-centric services to market, building a portfolio of unique products that take advantage of their broadband capabilities.

Introducing the Cisco IP/VC 3540 Series Videoconferencing System

The multifunctional, H.323-compliant Cisco IP/VC 3540 Series is based on a four-slot rack-mountable chassis and provides a choice of mix-and-match function modules for constructing a powerful videoconferencing resource. The configurable, scalable design has the

Figure 1

Cisco IP/VC 3540 Series

flexibility to meet a wide variety of functional and performance application requirements. The dual power supply provides protection against power system failures. The Cisco IP/VC 3540 Series is easy to install and maintain.

The Cisco IP/VC 3540 Series mix-and-match options include:

- The Cisco IP/VC 3540 Series Multipoint Conference Unit (MCU) module supports multiparticipant videoconferences, with a capacity of up to 100 conference participants per module.
- The Cisco IP/VC 3540 Series Rate Matching Module offers the flexibility to support multiple video rates in a single conference.
- The Cisco IP/VC 3540 Series H.320-to-H.323 Gateway module connects ISDN-based H.320 videoconference systems to H.323 users, or brings legacy H.320 systems into a H.323 multipoint conference.
- The Cisco IP/VC 3540 Series Application Server module and T.120 Data Conferencing Application together host document sharing, interactive whiteboard, and other collaboration tools critical to multimedia conferences, with a capacity of up to 100 conference participants per module.

The Cisco IP/VC 3540 Series Multipoint Conference Unit

The Cisco IP/VC 3540 Series MCU module is a powerful, advanced solution for real-time voice- and video-over-IP conferencing services. Designed for the Cisco IP/VC 3540 Series Videoconferencing System, the module provides cost-effective, high-quality, high-performance MCU technology. Its rich feature set makes it a superior solution for IP-centric videoconferencing over large enterprise communications networks.

The MCU supports:

- High-video-quality multipoint conferences, impromptu or scheduled
- Online conference monitoring and control
- 128- and 384-kbps business-quality videoconferences
- 768-kbps high-quality to 2-Mbps super-quality video sessions
- Two video display modes:
  - Voice Switched: All participants see a single location—the location of the current speaker. When the speaker changes, the MCU automatically switches the video to the new speaker's location.
  - Continuous Presence: All participants see a four-way view with one conference location in each quadrant. In conferences with more than four participants, audio detection logic automatically brings an off-screen speaker into a quadrant in the four-way display
- QCIF to CIF continuous presence for low delay and efficient network bandwidth utilization
- Audio announcements when participants join or leave a conference
- Web-based conference management, including:
  - Participant management—adding or dropping conference participants or locations
  - Chair control—fixing the video source to a selected participant or location
  - Audio source control—mute the audio from a participant or location
  - Video image management—fix any video source in a continuous presence conference to a selected quadrant of the four-way display
- Dynamic, midconference bandwidth adjustment
- T.120 data collaboration integrated with any multipoint conference

- Network quality of service (QoS)
- When equipped with the optional audio transcoder card, the MCU provides:
  - Transcoding between audio encoding methods for video- and audio-only conferences
  - Wideband audio mixing, offering high-quality audio when using endpoints that support G.722 encoding
  - Compatibility with endpoints and IP telephones supporting any one of the audio codecs
- When combined with the optional Cisco IP/VC 3540 Series Rate Matching Module, the system provides:
  - Videoconferences with participants connected at 128-kbps and 384-kbps
  - Continuous presence videoconferences with symmetric bandwidth (384-kbps into and 384-kbps out of the MCU)

The Cisco IP/VC 3540 Series MCU modules are available in three capacities to fit any need or budget. The largest supports 100 participants in one or more conferences at 128 kbps. (This same module can support 70 participants at 384 kbps, or 25 at 768 kbps. See Tables 4 and 5 in the specifications sections at end of this document.) Two other models support 60 participants at 128 kbps or 30 participants at 128 kbps.

Up to four modules may be installed in a chassis, providing significant scalability, even for high-bandwidth, high-quality videoconferences.

The Cisco IP/VC 3540 Series Rate Matching Module

The Cisco IP/VC 3540 Series Rate Matching Module is an option to the Cisco IP/VC 3540 Series MCUs that provides flexibility for managing the bandwidth of a videoconference. It is a video processing engine that alters the encoding of the video stream to match the capabilities of a particular endpoint or to accommodate an IP WAN connection between two locations.

The Rate Matching Module, together with the MCU, performs two functions:

- It supports mixed-rate conferences when endpoint capabilities require a conference to support participants at two different rates
- It supports symmetric conference rates for continuous presence conferences

The mixed-rate capability allows a 384-kbps meeting to include one or more participants at 128-kbps. This is common when a H.320 endpoint with a single ISDN BRI connection needs to join a conference through a gateway. With the Rate Matching Module, the slower endpoint will connect to the videoconference at its lower rate, while all the other parties maintain the higher speed. This ensures the best video quality for all participants in the conference.

For continuous presence conferences, the Rate Matching Module processes the four-way video image so that the data rate is symmetrical—the same bandwidth out of the MCU as into it. The symmetric conference rate makes it possible to have business-quality continuous presence conferences over a IP WAN connection or to include ISDN-based H.320 endpoints in a videoconference with continuous presence.

The Cisco IP/VC 3540 Series H.320-to-H.323 PRI Gateway Module

The Cisco IP/VC 3540 Series Gateway module bridges the gap between the installed base of ISDN videoconferencing group and room systems and the rapidly growing world of IP-based H.323 systems. The gateways connect H.320 video systems on ISDN to H.323 systems on IP by translating calls initiated from the Public Switched Telephone Network (PSTN) to their equivalent on the packet network, and vice-versa. Videoconference users have media-independent worldwide connectivity, regardless of their underlying network technology.

The Cisco IP/VC H.320-to-H.323 Gateway module offers:

- Two ISDN Primary Rate Interface (PRI) ports capable of T1 or E1 rates
- Bonded ISDN calls at 128, 256, 384, 512, 768, or 1420 kbps
- Support for 2B (2 x 64) calls
- Support for restricted mode (56-kbps instead of 64-kbps channels)
- Support for H.261 and H.263 video coding
- Support for G.711, G.728, and G.722 audio coding
- Optional transcoding between G.711 and G.728 or G.723 and G.711
- Call initiation from ISDN to IP, or IP to ISDN
- Interactive-voice-response (IVR) system to transfer inbound ISDN calls to the desired H.323 endpoint or multipoint conference
- Support for T.120 data conferencing

The Cisco IP/VC 3540 Series Gateway supports up to 23 calls at 128 kbps on ISDN T1 (30 calls on ISDN E1) or 7 calls at 384 kbps on ISDN T1 (10 calls on ISDN E1), or a mixture of calls at different bandwidths (see Tables 8 and 9 in the specifications at the end of this document).

The Cisco IP/VC 3540 Series Application Server and T.120 Conferencing Application

The Cisco IP/VC 3540 Series Application Server is a Pentium/Microsoft Windows Server platform that hosts applications critical to multimedia conferences, including the T.120 Data Conferencing Server Application. The Application Server/Data Conferencing Server combination makes data sharing an integral part of multipoint conferences. PC-based H.323 endpoints can be equipped with a T.120 application that allows users to dynamically share views of an application such as spreadsheets, documents, schedules, or Web pages. The ability to interactively change numbers in an analysis; point to a Web-page feature; view diagrams, graphic presentations, or slide lectures; or engage in text chats, whiteboard exchanges, or rapid file transfers can all greatly enhance the discussion.

Based on the ITU T.120 multimedia conferencing standard, the T.120 Data Conferencing Server offers scalability, reliability, and high performance. In addition to providing processing resources for data sharing while remaining transparent to conference participants, the server works with the Cisco IP/VC 3540 Series MCU to support a dynamic graphical-user-interface (GUI) "live" log, which offers the following features:

- Allows the user to monitor the application
- Reports every time a T.120 connection is requested
- Reports when a port is opened or closed
- Provides an alert function in the event of errors
- Is displayed in a generic window

Cisco IP/VC 3540 Series Features and Benefits

The Cisco IP/VC 3540 Series Videoconferencing System offers an exceptional set of features and benefits for videoconferencing users—and the businesses that host them (Table 1).

Table 1 Cisco IP/VC 3540 Series Features and Benefits

Features	Benefits
Cisco IP/VC 3540 Series MCU	
Three MCU modules are available, to handle 30, 60, or 100 simultaneous participants in a videoconference at 128 kbps. See Tables 4 and 5 for number of users supported at other bandwidths, or when continuous presence is enabled.	• Offers exceptional flexibility in building a system to meet your videoconferencing needs
Each MCU module can support multiple conferences simultaneously (such as one conference of 100 participants, four conferences of 25 participants, or ten conferences of 10 participants), up to the maximum number supported. You can run multiple conferences at different rates at the same time. You can increase the number of concurrent conferences transparently by adding more MCU modules.	• Helps you gain the most value for your videoconferencing system investment
You can combine multiple MCU modules into an MCU cluster, increasing the total number of concurrent videoconference calls per MCU to 200 (or 300 for audio-only conferences)	• Distributed architecture enhances configuration flexibility and allows the system to meet a broad range of customer requirements
• Cascading multiple Cisco IP/VC 3540 Series MCU modules can create larger conferences. • Cascaded modules can be centralized in the data center or geographically distributed.	• Provides scalability • Enables more efficient use of bandwidth
• Conference control—Easy-to-use Web interface allows a conference moderator to perform a variety of functions: – Monitor all conferences and participants in real time – View participant information including name, number, IP address, video and audio codecs in use, and time joined the conference – Create a conference and assign a conference password – Select the source to be viewed by all participants – Lock a selected participant into a quadrant during a continuous-presence conference – Add or drop participants in a conference – Mute a participant – Initiate data collaboration – Manage a multi-MCU cascaded conference from an integrated list showing participants on all MCUs	• Conference chair can easily monitor and manage the conference
• Users can initiate impromptu conferences or schedule through compatible third-party scheduling applications.	• Offers easy, spontaneous conference initiation or prescheduled events to match customer's style and collaboration needs
• Conference entry may be password-protected. • Administrative functions are password-protected. • Chair control is password-protected.	• Ensures participants' privacy and administrative security

Table 1 Cisco IP/VC 3540 Series Features and Benefits

Features	Benefits
• Entry/Exit audio indications play when conference participants join or leave a conference • Custom indications can be recorded to suit the requirements of the organization	• Provides security by announcing when new participants join the conference, or when participants leave the conference
• The system offers a continuous-presence windowed display that shows four conference participants at once. • For large conferences, voice detection automatically switches an off-screen speaker into the display. • Using the Web interface, a conference moderator has full control of participant location in the four-way display.	• Allows users to see multiple locations in one view
• The system offers full-screen viewing with voice-activated switching.	• Offers voice-activated switching with adjustable switching delay • Provides optional video source management via chair control
• With the optional Audio Transcoder Card, conference participants may use G.711, G.722, G.723, G.728, or G.729 audio encoding	• The MCU matches the audio capabilities of each calling endpoint, seamlessly mixing the audio from all participants • In a conference with mixed audio capabilities, all callers will hear the best quality audio possible
• The system works with the Cisco Multimedia Conference Manager (MCM) for gatekeeper/proxy functions.	• Offers gatekeeper for call-control and bandwidth management • Offers QoS for IP networks • Offers security and authentication for H.323 videoconference calls • Offers superior scalability for larger networks
Diagnostics • Power-on self-test for CPU, interfaces, and memory when the unit is turned on. • Front-panel LED indicators. • Monitoring capabilities via Telnet or a serial console.	• Checks system health and monitors regularly
Remote Administration: • System installation and configuration is achieved via a Web-browser interface. • Software upgrades are performed over the network.	• Offers easy installation, configuration, and management
The Cisco IP/VC 3540 Series Rate Matching Module enables: • Rate matching between conference participants with different capabilities • 128-kbps and 384-kbps participants in the same voice-switched full-screen conference • Continuous presence conferences with equal bandwidth (at 384-kbps) going to and from the H.323 endpoint	• Enables efficient use of network bandwidth • Allows each participant in the conference to receive the best video quality possible
• Up to 10 Rate Matching Modules can be assigned to a single MCU	• Scales the rate matching capacity to meet the most demanding requirements

Table 1 Cisco IP/VC 3540 Series Features and Benefits

Features	Benefits
Cisco IP/VC 3540 Series H.320-to-H.323 Gateway	
Videoconferencing connectivity offers the following features: • Provides connectivity between H.323 LAN-attached endpoints and H.320 ISDN-connected endpoints • Offers configurable E1/T1 PRI network interface • Supports all major central-office switch and private-branch-exchange (PBX) protocols	• Enables "new-world" IP connectivity to reach installed base of ISDN-based endpoints • Simplifies sparing and training—single model can be installed worldwide
Standards supported include the following: • Complies with ITU H.320 and H.323 standards for multimedia conferencing • Supports WAN communication interfaces (ISDN PRI) • Supports ITU audio transcoding (G.711/G.723 and G.711/G.728) • Supports T.120 data conferencing	• Offers investment protection via standards support • Is interoperable and compatible with other standards-based systems
Call-routing features include the following: • Supports IVR; dual tone multifrequency (DTMF); direct inward dial (DID); or TCS4 internal extension	• Offers multiple methods for ISDN callers to reach IP-based endpoints
Dual ISDN-PRI interface supports T1 or E1 (NT/TE)	• Offers configuration flexibility
The Cisco IP/VC 3540 Series H.320-to-H.323 Gateway is easy to install, configure, and manage: • Enables management via Web browser from anywhere on the network • Provides local IP configuration via serial port • Provides remote software upgrades via the network	• Easy to install, configure, and manage from central location
Cisco IP/VC 3540 Series Application Server/Data Conferencing Server Software (AS/DCS)	
The Cisco IP/VC 3540 Series AS/DCS enables the following with the MCU module and T.120-capable endpoint terminals: • Whiteboard • Document sharing • Product demonstrations • Graphics display	• Enables data collaboration as a part of a videoconference
T.120 data-conference monitoring offers the following features: • Reports every time a T.120 connection is requested • Reports when a port is opened or closed • Provides an alert function in the event of errors • Allows the user to monitor the application • Is displayed in a generic window	• Allows the conference moderator to monitor the participants and T.120 conference status

Specifications for the Cisco IP/VC 3544 Chassis

Table 2 provides specifications for the Cisco IP/VC 3544 Four-Slot Chassis.

Table 2   Cisco IP/VC 3544 Four-Slot Chassis Specifications

Front-Panel LEDs	• POWER—indicates power status • FAN LED—indicates fan status • TEMP LED—indicates cabinet-temperature status • ALARM LED—indicates a system module failure in the top slot
Dimensions	Height: 2U, or 3.5 in. (8.89 cm) Width: 19 in. (48.26 cm) Depth: 10 in. (2.54 cm)
Weight	12.1 lb (5.5 kg) for empty chassis without modules
Power	100-240 VAC, 50-60 Hz
Environmental	Normal operation: 32° to 104°F (0° to 40°C) Storage: –40° to 167°F (–40° to 85°C)
Agency Compliance	Emissions: • FCC Part 15 (CFR 47) Class A • ICES-003 Class A • EN 55022 Class A • CISPR22 Class A • AS/NZS3548 Class A • VCCI Class A • EN 61000-3-3 • EN 55024 • EN 50082-1 Immunity: • EN61000-3-2 Safety: • UL 1950 • CSA C.22.2 No 950 • IEC 60950 • EN 60950 • AS/NZS 3260 • TS001

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Specifications for the MCU Module

Tables 3–5 provide specifications for the MCU module.

Table 3 MCU Module Specifications

LAN Interface	100BASE-T (10/100), RJ-45
Serial Port	EIA-232, DB-9
Protocols	H.323, T.120
Video Coding	H.261, H.263, QCIF/CIF, 4CIF
Audio Coding (without transcoder card)	G.711 a/μ-law
Audio Coding (with transcoder card)	G.711 a/μ-law, G.722, G.723.1, G.728, and G.729 Up to 30 calls in videoconferences and up to 60 calls in audio-only conferences.
Data Collaboration	T.120
Panel LEDs	GK Reg (registered with Gatekeeper), CPU High, Alarm, Activity
Module Dimensions	Height: 0.81 in. (2.1 cm) Width: 9.19 in. (23.34 cm) Depth: 6.3 in. (16 cm)
Module Types Available	A single module type supports both system (top, slot 1) and add-on (slots 2-4) positions in the Cisco IP/VC 3544 chassis.
Software Upgrades	Remote software upgrade by administrator using software utility

Table 4 MCU Module Capacity for Voice-Switched Conferences

	Number of Participants in Conference(s)		
Call Bandwidth	**100-Session Module**	**60-Session Module**	**30-Session Module**
128 Kbps	100	60	30
384 Kbps	70	42	21
768 Kbps	25	15	7
1.5 Mbps	15	9	4
2.0 Mbps	10	6	3
Audio Only	150	90	45

Table 5 MCU Module Capacity for Continuous-Presence Conferences

	Number of Participants in Conference(s)		
Video Rate (kbps) into MCU (QCIF)/Out from MCU (CIF)	**100-Session Module**	**60-Session Module**	**30-Session Module**
110/440	66	40	20
320/1280	45	27	13

Table 6 provides the specifications for the Cisco IP/VC 3540 MCU Audio Transcoder Card (for 30-Session and 60-Session Modules).

Table 6 MCU Module Audio Transcoder Capacity

Audio Codec	Number of Simultaneous Calls
G.723.1	30
G.722	15
G.728	30
G.729	30

Specifications for the Cisco IP/VC 3540 Series Rate Matching Module

Table 7 provides specifications for the Cisco IP/VC 3540 Series Rate Matching Module.

Table 7 Rate Matching Module Capacity

Type of Conference and Rate Match	Number of Simultaneous Conferences Supported per Rate Matching Module		
Full-screen, single participant video view incorporating participants at 128-kbps and 384-kbps	6	3	0
Continuous presence conference at 384-kbps (symmetric data flows, 384-kbps in and out of MCU)	0	2	4

Specifications for the Gateway Module

Tables 8 and 9 provides specifications for the gateway module.

Table 8   Gateway Module Specifications

LAN Interface	• 100BASE-T (10/100), RJ-45
WAN Interfaces	• Configurable dual PRI (TE or NT) interface with RJ-48 connector • T1 mode—23B+D: clock rate of 1.544 Mbps, ESF or D4 framing, binary 8-zero substitution (B8ZS) or alternate-mark-inversion (AMI) encoding, line impedance 100 ohms • E1 mode—30B+D: clock rate of 2.048 Mbps, G.704 with cyclic-redundancy-check-4 (CRC4) framing, HDB3 or AMI encoding, line impedance 120 ohms
Serial Ports	• EIA-232, DB-9
Protocols	• H.323, H.320, T.120
ISDN Protocols	• AT&T 5ESS • Northern Telecom DMS 100 • National ISDN-1 (NI-1) • Euro-ISDN
Video Coding	• H.261, H.263, QCIF/CIF
Audio Coding	• G.711, G.722, G.723, G.728 • Optional transcoding between G.711 (ISDN) and G.723 (IP) or G.728 (ISDN) and G.711 (IP)—20 channels
Data Collaboration	• Supports T.120 data collaboration; rates up to 64 kbps
Panel LEDs	• LAN: Link present, link speed 100 Mbps • GK: Registered with gatekeeper • Alarm • PSTN: Carrier detect, activity
Module Dimensions	Main gateway module: • Width: 9.187 in. (23.35 cm) • Depth: 6.3 in. (16 cm) • Weight: 1.12 lb (0.506 kg) Rear transition module—input/output (I/O) interface for PSTN: • Width: 9.187 in. (23.35 cm) • Depth: 3.15 in. (8 cm) • Weight: 2.55 lb (1.156 kg)
Module Types Available	A single module type supports both system (top, slot 1) and add-on (slots 2-4) positions in the Cisco IP/VC 3544 chassis.
Software Upgrades	Remote software upgrade by administrator using software utility

Table 9 Gateway Module Capacity

Call Bandwidth	Maximum Calls on PRI T1	Maximum Calls on PRI E1
64 kbps (voice only)	46	60
128 kbps	23[1]	30[1]
256 kbps	11	15[1]
384 kbps	7	10

1. The call capacity of the gateway is decreased when the audio transcoding or T.120 data-conferencing features are used.

Specifications for the Application Server Module with Data-Conferencing Server Software

Table 10 provides specifications for the Application Server/Data Conferencing Server.)

Table 10 Application Server/Data-Conferencing Server Specifications

LAN Interface	100BASE-T (10/100), RJ-45
Serial Port	EIA/TIA-232, RJ-45
Protocols	T.120
Panel LEDs	Power, hot-swap
Module Dimensions	Height: 0.8 in. (19.8 mm) Width: 9.2 in. (233.4 mm) Depth: 6.3 in. (160.0 mm)
Number of Concurrent T.120 Sessions	30, 60, or 100, depending on license
Module Types Available	Add-on (can occupy slot 2, 3, or 4 in Cisco IP/VC 3544 chassis)
Software Upgrades	Remote software upgrade by administrator using virtual interface

Service and Support Solutions

Cisco AVVID (Architecture for Voice, Video and Integrated Data) support solutions are delivered by a team of design and technical experts trained and certified in this highly specialized field. Cisco and its specialized channel partners offer implementation services based on tested and verified designs and best practices. Delivered through Cisco and its partners, end-to-end services enable businesses to configure and optimize each converged solution. Cisco service and support solutions enhance the value of your investments in network infrastructure, resulting in an overall reduction in the cost of doing business.

- *Advanced Services* enable you to plan, design, build, implement, and optimize your solution for rapid deployment and increased stability and availability.
- *Technical Support Services* provide the maintenance and troubleshooting you need to keep your solution operational.

Delivered directly or through an ecosystem of best-of-breed service partners, Cisco provides strategic and consultative support that maps to each stage of the solution life cycle: planning, design, implementation, operation, and optimization (PDIOO).

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